

Original: Fish Division
cc: Mr. A. T. Stewart 10-15-42
Mr. L. E. Perry
Education-Game

(W)

INSTITUTE FOR FISHERIES RESEARCH Institute for Fish. Res.
DIVISION OF FISHERIES
MICHIGAN DEPARTMENT OF CONSERVATION
COOPERATING WITH THE
UNIVERSITY OF MICHIGAN

oak

ALBERT S. HAZZARD, PH.D.
DIRECTOR

ADDRESS
UNIVERSITY MUSEUMS ANNEX
ANN ARBOR, MICHIGAN

September 28, 1942

REPORT NO. 824

A FISHERY SURVEY OF LITTLE PORTAGE AND BIG PORTAGE LAKES,

WASHTENAW AND LIVINGSTON COUNTIES

by

L. E. Perry

Introduction

Location and Drainage

Little Portage Lake is located in Dexter Township of Washtenaw County, T. 1 S., R. 4 E., Secs. 2 and 11. Big Portage is in Dexter Township of Washtenaw County and Putnam and Hamburg Townships of Livingston County, T. 1 N., 1 S., R. 4, 5 E., Secs. 1, 2, 31, 36. The two are closely connected by a short, broad channel. They are the center of a fairly large drainage area, including Portage River (Portage Creek), Pinckney Creek (Honey Creek) and the many lakes that they drain. Big Portage is directly connected with Huron River which passes close by the east side of the lake.

The town of Pinckney is three miles northwest of the lakes and Dexter is about six miles south. Both lakes are readily accessible by the paved county road connecting these two towns. Other roads nearly encircle Big Portage Lake.

Acknowledgments

The Portage Lakes were mapped by an Institute party in 1939; Little Portage on February 18, and Big Portage on March 16. They were given biological inventories on September 5-11, 1941.*

Past and Present Use

These lakes have apparently been used for no industrial purposes in the past. Their principal importance at present is that of recreation and

* Mapping party: G. F. Perry, leader; O. Jasmin and L. Newton, assistants.

Inventory party: F. E. Locke, leader; B. P. Hunt, B. W. Walker and S. Lievens, assistants.

permanent home sites. Little Portage Lake with low, marshy shores has not been greatly developed, but Big Portage Lake has one resort, five boat liveries and about 225 cottages spread around the shore except the marshy northeast end. Swimming and boating are popular in Big Portage Lake where the broad, sandy, shallow bottom makes ideal swimming beaches around a considerable part of the shore.

Fishing is fair in Big Portage Lake. Some decline has been reported during the past several years, especially in bluegills and walleyes. Little Portage has a better reputation among the local anglers; however, the catch of bluegills is reported to have dropped in this lake, also. Since both lakes are popular and easily accessible, their fisheries have considerable importance.

Physical Characteristics

Geological Origin

I. D. Scott in "Inland Lakes of Michigan" describes in brief some of the geology of the Portage Lakes in connection with their being part of a chain comprising also Base Line, Strawberry and Zukey Lakes. These lakes

"are located in the valley of the Huron River southwest of Lakeland.... They all occupy parts of an elongated pit that extends in a northeast-southwest direction from Lakeland to Portage Lake. This pit was formed by the burial of an ice mass of very irregular outline and thickness in a former drainage channel through which the water from the glacier escaped in a northwesterly direction beyond Pinckney and thence to the southwest towards Jackson. The subsequent melting of the ice left a depression below the level of the outwash, which conformed in general outline to the ice mass and also contained a number of deeper basins which contain the present lakes.

"The several lakes of the group are not discussed independently because the adjustment of the present shores is insignificant and also because a higher level was found at an elevation sufficient to have merged all into one large lake having numerous bays, peninsulas and islands. The principal indication of this stage is the gently sloping flat which extends from the lake shores back to the sharp cliffs and is interpreted as an exposed terrace. In addition, bars which swing out from steep cliffs were found."

Shape of Basin and Extent of Drainage

The long axes of both Portage Lakes are nearly continuous and extend in a northeast-southwest direction. Little Portage has an irregular outline with the largest and deepest part in the northeast end. Big Portage has one deep basin of considerable extent with a long arm extending on the northeast. The lake is nearly two miles long and over a mile wide across the largest basin. It has a surface area of 644 acres and a maximum depth of 84 feet. The deepest point is approximately 1/4 miles northeast of the inlet from Little Portage Lake. Little Portage has a surface area of 101 acres, a length of two-thirds mile and maximum depth of 42 feet.

The adjacent land around Little Portage Lake is marshy while the surrounding country is slightly rolling. Big Portage Lake has somewhat marshy shores but these are for the most part suitable for cottage development. The northwest shore is the only part which is too low and marshy for suitable cottage sites. The surrounding country is rolling and partially wooded.

These lakes drain an area of approximately 120 square miles in Livingston, Washtenaw, Ingham, and Jackson Counties.

Water Fluctuation

Fluctuation of the water level is not great since there is a dam in the outlet of Big Portage that controls the level. There has been considerable local controversy concerning the level which has been maintained, cottage owners on low land objecting to the level desired by those on high land. However, there seems to be no fisheries problem involved in this case.

The principal inlets are Portage Creek and Pinckney Creek. Both are of good size when they enter the lakes. Portage Creek flows into the north side of Little Portage Lake which in turn is connected with Big Portage by a channel about 45 feet wide. Pinckney Creek, about 15 feet wide, enters the northwest side of Big Portage Lake. Several minor streams drain into the lakes from the surrounding marshes. An artificial inlet from Huron River to Big Portage, about one-third mile upstream from the outlet, has been made by local home owners. The flow of water in this channel is aided by placing a low rock barrier across the river; however, the level of the lake is often high enough so that the flow is from Portage Lake into the river. This channel has no important effect on the lake insofar as fisheries are concerned. It does permit a free passage of fish.

The natural outlet of the lake is into the Huron River at a point near the southeastern tip of the lake. It is a stream about 50 feet wide and carries a considerable supply of water to the Huron River. About 150 feet from the lake is a rough rock dam which stands about three feet high. This is owned and controlled by the land owners around the lake. Its sole purpose is to maintain what is considered a suitable level by its operators. At the time of the survey no provision had been made for passage of fish upstream over the dam.

A summary of the physical data of the lakes is given in Table 1.

Table 1
Physical data of Big Portage and Little Portage Lakes

Lake	Area (acres)	Maximum depth (feet)	Shore development*	Dominant bottom types		Color of water	Transparency (Secchi disc in feet)
				Shallows	Depths		
Big Portage	644	84	1.7	Sand	Muck	Colorless	10
Little Portage	101	42	1.7	Marl, muck.	Muck	Light brown.	9½

* Shore development expresses the number of times a shoreline is greater than that of a perfectly round lake of the same area.

Discussion of Physical Factors in Relation to Fisheries

The physical features of Little Portage Lake are more favorable to high productivity than those of Big Portage Lake. It is of smaller size, has a fairly large amount of marl bottom, and its shoreline is such as to form several protected shallow bays. These features are more suitable than the predominant broad sand shallows of Big Portage. Although the shore development is the same for both lakes (1.7), Big Portage has fewer embayments and a large amount of unprotected shallow area in the south end that is not very productive. Some of these sand and gravel shallows, however, should provide good spawning beds. The transparency and color are similar in both lakes and differ little from the conditions in most Southern Michigan lakes.

Temperature and Chemical Characteristics

Temperature

Temperature and chemical observations were made near the deepest point in both lakes and also in the principal inlets and the outlet of Big Portage Lake. The data obtained at the deepest stations are shown in Table II.

The water in Big Portage Lake was uniformly warm from the surface to a depth of 21 feet (70-74°F.). From 21 to 33 feet there was a rapid change in temperature from 70 to 51°F., a drop of 20 degrees in 12 feet. At the bottom (78 feet) the temperature was 44°F. The middle zone of rapid change in temperature is called the thermocline and is important in lake biology because it prevents a mixing of the upper warm water with the lower cold water.

There was a thermocline in Little Portage Lake at a slightly shallower depth, from 18 to 27 feet. The surface water was 69°F. and the bottom 50°F.

Chemical Conditions

Oxygen was plentiful for fish life in and above the thermocline in both lakes but it was depleted below. In Big Portage Lake there were 8.1 parts per million at the surface and 0.6 at the bottom of the thermocline. In Little Portage there were 8.1 parts per million at the surface and a similar amount down through the thermocline. The amount of oxygen fell off rapidly in the bottom ten feet of water (28 to 38 feet) and at the bottom it was exhausted.

Both lakes have hard, alkaline water. In Big Portage Lake the methyl orange alkalinity ranged from 168 to 180 parts per million. In Little Portage it ranged from 165 to 247. The pH range was similar in both, 7.3 to 8.4. Generally, moderately hard, alkaline water is the most productive.

Pollution

No pollution was observed or reported in these lakes.

Table II
Chemical and temperature data from
Big Portage and Little Portage Lakes

Depth (feet)	Big Portage Lake Station, 9/7/41				Little Portage Lake Station 1, 9/13/41			
	Temperature (°F.)	Oxygen (p.p.m.)	M. O. alkalinity (p.p.m.)	pH	Temperature (°F.)	Oxygen (p.p.m.)	M. O. alkalinity (p.p.m.)	pH
0	73	8.1	168	8.4	69	8.1	165	8.4
3	74	...	...	...	69	...	...	...
6	71	...	...	...	...	...	...	...
9	71	...	...	...	...	...	...	...
12	71	...	...	...	...	...	...	...
15	71	...	...	...	69	...	...	...
18	70	...	...	...	68	7.9	165	8.2
21	70	7.9	170	8.4	66	...	...	...
24	68	...	...	...	58	...	...	...
27	67	...	...	...	53	8.1	160	8.2
30	53	...	...	...	52	...	...	...
33	51	0.6	190	7.4	51	...	...	...
36	50	...	...	...	50	...	...	...
39	49	...	...	...	50*	0.0	247	7.3
42	48	...	...	...	...	...	...	...
45	47	...	...	...	...	...	...	...
48	46	...	...	...	...	...	...	...
51	46	...	...	...	...	...	...	...
54	46	...	...	...	...	...	...	...
57	45	...	...	...	...	...	...	...
60	45	...	...	...	...	...	...	...
63	...	...	...	...	...	...	...	...
66	...	...	...	...	...	...	...	...
69	44	...	...	...	...	...	...	...
72	...	...	...	...	...	...	...	...
75	...	...	...	...	...	...	...	...
78	44	0.1	180	7.4	...	...	...	...

* Bottom sample at 38 feet.

Discussion of Temperature and Chemical Factors
in Relation to Fisheries

The surveys of these lakes were made at a time when the oxygen content of the bottom waters would be near the lowest of the year. In Big Portage Lake there was sufficient oxygen for fish only to a depth of about 30 feet. The lower part of this zone was cold enough to permit the favorable growth of a limited number of trout or other cold-water fish. The extent of this favorable zone will not remain the same throughout the year but it would probably never be less than at the time of the survey. Since ciscoes were found in this region of the thermocline and they have not been reported to suffer any heavy losses in this lake, they may be taken as evidence of the suitability of that water to cold-water species.

Only the bottom few feet of Little Portage Lake were undesirable for fish life because of insufficient oxygen. A small portion of the lake in and below the thermocline was suitable to cold-water fish. The upper regions were necessarily limited to warm-water species.

The alkalinity and hardness of these waters are favorable for good fish production.

Biological Characteristics

Vegetation

A list of the plants collected in the Portage Lakes is given in Table III.

Table III
List of plants found in Big Portage and
Little Portage Lakes

Common name	Scientific name ✓	Relative abundance	
		Big Portage Lake	Little Portage Lake
Waterweed (<u>Anacharis canadensis</u>)		Common	Few
Water marigold (<u>Megalodonta Beckii</u>)		Rare	...
Coontail (<u>Ceratophyllum demersum</u>)		Common	Common
Water willow (<u>Decodon verticillatus</u>)		Few	...
Star duckweed (<u>Lemna trisulca</u>)		Few	...
Water milfoil (<u>Myriophyllum sp.</u>)		Common	Few
Bushy pondweed (<u>Najas flexilis</u>)		Few	Few
White water lily (<u>Nymphaea odorata</u>)		Few	...
Yellow water lily (<u>Nuphar variegatum</u>)		Abundant	...
Yellow water lily (<u>Nuphar advena</u>)		Rare	...
Arrow arum (<u>Peltandra virginica</u>)		Rare	Few
Pickereel weed (<u>Pontederia cordata</u>)		Common	...
Pondweed (<u>Potamogeton americanus</u>)		Few	...
Large-leaf pondweed (<u>P. amplifolius</u>)		Few	Few
Variable pondweed (<u>P. gramineus</u>)		Common	...
Floating-leaf pondweed (<u>P. natans</u>)		Few	...
Sago pondweed (<u>P. pectinatus</u>)		Common	...
Clasping-leaf pondweed (<u>P. Richardsonii</u>)		Few	...
Pondweed (<u>P. panormitanus</u>)		Few	...
Whitestem pondweed (<u>P. praelongus</u>)		...	Few
Flat-stemmed pondweed (<u>P. zosteriformis</u>)		Few	...
Wapato (<u>Sagittaria latifolia</u>)		Rare	...
Arrowhead (<u>Sagittaria spp.</u>)		Few	...
Bulrush (<u>Scirpus subterminalis</u>)		Few	Few
Big duckweed (<u>Spirodela polyrhiza</u>)		Few	...
Common cattail (<u>Typha latifolia</u>)		Few	...
Narrow-leaved cattail (<u>T. angustifolia</u>)		Few	...
Bladderwort (<u>Utricularia vulgaris</u>)		Few	...
Wild celery (<u>Vallisneria americana</u>)		Rare	...
Watermeal (<u>Wolffia punctata</u>)		Few	...
Water star grass (<u>Heteranthera dubia</u>)		...	Few
Musk grass (<u>Chara sp.</u>)		Few	...

✓ Identifications by Betty R. Clarke and F. E. Locke.

Although Little Portage Lake has a smaller list of species, it actually has a more abundant growth of plants which provide good cover for fish and undoubtedly harbor many fish food organisms. The vegetation in most of Big Portage Lake is rather scant. We believe there is enough, however, to provide the necessary cover for the fish now inhabiting the lake.

Fish Foods

The small, free-floating organisms (plankton) was rather abundant in both lakes; however, plankton varies considerably from time to time and a single sample is therefore not always an index of productivity.

Bottom food organisms were fairly abundant in Little Portage Lake in both the shallow areas and in the depths. In Big Portage Lake they were less abundant in the shallows but equally abundant in the depths. The organisms on plants in the shallow areas are the most important source of food.

Forage fish were abundant in both lakes.

Fish Present

A list of the fish found in the Portage Lakes is presented in Table IV. Collections made by the survey party were supplemented by record and notes of Dr. C. L. Hubbs. We believe the list presented is unusually exhaustive.

Table IV
Relative abundance and stocking of fish in
Big Portage and Little Portage Lakes*

Species	Big Portage Lake		Little Portage Lake	
	Abundance	Stocking (1933-1941)	Abundance	Stocking (1933-1941)
GAME FISH				
Northern pike	Few	...	Few	...
Perch	Common	51,000 (7-9 mo.)	Few	...
Walleye	Few	220,000 fry	...	...
Smallmouth bass	Few	...	...	...
Largemouth bass	Common	9,600 (3-6 mo.)	Common	1,350 (3-4 mo.)
Bluegill	Abundant	129,000 (3-6 mo.)	Abundant	65,500 (4-5 mo.)
Rock bass	Common	...	Common	...
Black crappie	Common	...	Common	...
Pumpkinseed	Few	...	Few	...
Long-eared sunfish	Common	...	Common	...
Warmouth bass	...	...	Few	...
Green sunfish	Few	...	...	...
Cisco	Common	...	...	...
COARSE FISH				
Common sucker	Rare	...	...	...
Hog molly	...	...	...	...
Lake chub-sucker	Few	...	Few	...
Northern redhorse	...	...	...	...
Golden mullet	Few	...	...	...
Brown bullhead	...	...	...	...
Yellow bullhead	Few	...	Few	...
OBNOXIOUS FISH				
Long-nosed gar	Common	...	...	...
Dogfish	...	...	...	...
Carp	Few	...	...	...
Mud pickerel	Few	...	...	...
FORAGE FISH				
Creek chub	...	...	...	...
Horny-headed chub	Few	...	...	...
River chub	Rare	...	...	...
Fine-scaled dace	...	...	...	...
Black-nosed dace	...	...	...	...
Golden shiner	Few	...	...	...
Rosy-faced shiner	...	...	...	...
Common shiner	Common	...	Common	...
Spot-tailed shiner	Few	...	Common	...
Black-chinned shiner	Rare	...	Few	...
Black-nosed shiner	...	...	...	...
Straw-colored shiner	Common	...	Common	...
Mimic shiner	Common	...	Few	...
Blunt-nosed minnow	Common	...	Common	...
Stone-roller minnow	Rare	...	...	...
Stonecat	...	...	...	...
Tadpole madtom	Few	...	...	...
Brindled madtom	Few	...	Few	...
Mudminnow	Few	...	...	...
Banded killifish	...	...	...	...
Blackstripe top-minnow	Common	...	Common	...
Black-sided darter	Few	...	...	...
Log-perch	Few	...	Few	...
Johnny darter	Few	...	Few	...
Iowa darter	Common	...	Common	...
Rainbow darter	Few	...	...	...
Fantail	Few	...	...	...
Least darter	...	...	...	...
Green-sided darter	Rare	...	...	...
Silversides	Abundant	...	Few	...
Muddler	...	...	...	...

The following species have been reported in the Portage Lakes, but their occurrence at present is doubtful:

Sturgeon	...	...	...	...
Great Lakes whitefish	...	...	...	...
Rainbow trout	...	...	...	...
Brook trout	...	...	...	...
Lake trout	...	...	...	...
Eel	...	...	...	...
Sheepshead	...	...	...	...

* This list of fish was obtained from Dr. C. L. Hubbs. The relative abundance is based on collections made by the survey party.

Both lakes have approximately the same species of game fish except that walleyes and smallmouth bass are found in Big Portage only. The relative abundance of all species is about the same in both lakes. Bluegills are the most abundant, and perch, largemouth bass, rock bass, black crappie, and long-eared sunfish are rated as common.

Garpike, dogfish, and carp are known to occur in the lakes, but it is doubtful that their abundance is such as to have a detrimental effect. On the contrary, they may be useful in controlling the panfish population. The removal of some "obnoxious" fish has been carried out by local spearing parties under the direction of Conservation Officer K. Brushaber.

Several of the forage fishes listed in Table IV probably actually were stream inhabitants and were accidentally found in the lakes; however, the population of forage fish in these two lakes is rather large. The most common forms are the common shiner, straw-colored shiner, mimic shiner, blunt-nosed minnow, stone-roller minnow, blackstripe top-minnow, Iowa darter, and silversides.

Creel Census

A few creel census reports have been obtained by conservation officers. They tend to substantiate the rating of abundance of game fish given in Table IV.

Growth Rate of Game Fishes

By studying scales it is possible to determine the ages and estimate the rate of growth of most game fish. The results of such a study on the fish collected by the survey party are shown in Table V. The average growth of the different game fish in the State of Michigan is given in the last column of the table.

Table V
Growth of game fish in Big Portage and Little Portage Lakes

Name	Age*	Big Portage Lake			Little Portage Lake			Tentative average length for Michigan *		
		Number of individuals	Average length (inches)	Average weight (lbs. - oz.)	Number of individuals	Average length (inches)	Average weight (lbs. - oz.)			
Northern pike	I	3	16.8	...	14.5	1	17.1	...	15.0	...
	II	1	19.3	1	4.5	1	18.1	1	3.0	...
	IV	1	22.9	2	4.0	...	...	...	...	...
Perch	0	4	2.5	...	0.1	...	...	...	...	2.9
	I	5	3.8	...	0.4	...	...	...	...	4.7
	II	3	5.3	...	0.8	4	5.0	...	0.8	6.2
	IV	1	7.6	...	3.1	...	...	...	...	7.8
Walleye	VI	2	21.7	4	0.0	...	...	...	...	...
Smallmouth bass	0	1	3.0	...	0.2	...	...	...	...	3.7
	I	2	6.9	...	2.5	...	...	...	...	6.0
	II	6	10.0	...	7.2	...	...	...	...	8.8
	III	2	12.0	...	13.8	...	...	...	...	10.7
Largemouth bass	0	12	3.4	...	0.3	...	...	...	...	3.6
	I	14	7.4	...	3.0	3	5.3	...	1.0	5.5
	II	1	10.5	...	7.6	...	...	...	...	8.4
	III	1	11.8	...	11.5	2	10.3	...	8.1	10.8
Rock bass	0	5	1.4	...	0.1	...	...	...	...	1.6
	I	17	3.0	...	0.3	...	...	...	...	3.2
	II	5	4.6	...	1.2	...	...	...	...	4.3
	III	3	5.4	...	1.8	...	...	...	...	4.9
	IV	7	6.2	...	2.6	...	...	...	...	5.6
	V	1	7.8	...	4.9	...	...	...	...	6.6
Bluegill	VI	1	7.7	...	5.0	1	7.6	...	4.6	8.3
	I	12	3.1	...	0.3	...	...	...	...	3.0
	II	19	4.4	...	0.9	3	4.6	...	1.1	4.3
	III	22	5.9	...	2.1	23	5.8	...	2.0	5.6
	IV	8	6.4	...	3.1	14	7.1	...	4.5	6.7
	V	1	9.2	...	9.9	1	7.0	...	3.6	7.4
	VI	1	8.4	...	6.8	...	...	...	...	7.8
	VII	2	9.7	...	11.1	...	...	...	...	7.9
VIII	2	9.4	...	11.2	...	...	...	...	8.3	
Black crappie	I	16	5.3	...	1.1	8	4.9	...	1.0	5.3
	II	25	7.9	...	4.4	3	7.7	...	3.9	5.9
	III	3	9.9	...	8.7	...	...	...	...	8.7
	IV	1	10.4	...	9.9	1	11.3	...	12.1	9.2
	V	...	...	...	...	1	11.4	...	13.7	9.7
Pumpkinseed	I	4	2.7	...	0.2	...	...	...	...	2.7
	II	5	4.5	...	1.1	...	...	...	...	4.4
	III	2	5.7	...	2.4	...	...	...	...	5.8
Long-eared sunfish	0	1	1.5	...	0.1	...	...	...	...	...
	I	12	2.4	...	0.2	...	...	...	...	...
	II	3	2.6	...	0.2	...	...	...	...	...
	III	1	3.4	...	0.5	...	...	...	...	...
IV	1	3.1	...	2.1	...	...	...	...	...
Warmouth bass	III	...	...	...	...	1	4.1	...	0.8	...
Cisco	I	19	8.1	...	2.6	...	...	...	...	...
	II	16	10.1	...	5.2	...	...	...	...	...
	III	18	12.3	...	9.8	...	...	...	...	...
	IV	8	13.5	...	15.9	...	...	...	...	...
	V	2	15.2	1	1.6	...	...	...	...	...
	VI	3	15.8	1	2.8	...	...	...	...	...
	VII	2	17.4	1	10.5	...	...	...	...	...

* Determined by W. C. Beckman.

By inspection of the table it can be seen that in Big Portage Lake the growth of small- and largemouth bass, rock bass, bluegills, and black crappies is above average; that of the pumpkinseed is average while only the growth of perch is less than average. In Little Portage Lake the black crappies and bluegills grow faster than average, the largemouth and rock bass grow at an average rate and again only the perch are slower than average.

Although state averages have not been determined for the other species in the table, it is believed that their growth is satisfactory.

Natural Propagation

Young of all game fish were collected by the survey party. This is good evidence of the natural propagation of these fish, since any hatchery stocking during 1941 would have been made after the time of the survey. Ample spawning facilities are available for all species in the lakes.

Management Proposals

Designation of Lakes

Both Big Portage and Little Portage Lakes have been in the "all other lakes" category. This study has shown no reason for changing this designation.

Stocking

The stocking of all fish now found in the lake should be discontinued. Natural propagation is sufficient to meet the present needs. In view of the fact that both lakes have a fair amount of cold water that will support fish, experimental stocking of rainbow trout is advisable. It is suggested that during the late fall of 1942, 1,000 legal rainbow trout be planted in Little Portage Lake and 3,000 in Big Portage Lake. A similar plant should be made the following year. The success of this experiment will be followed by occasional creel census, and future planting recommendations will be based on the information obtained.

Predators and Parasites

Gars and dogfish were the only predators reported in Big Portage Lake and they have not been proven detrimental. No control is recommended. The bass tapeworm (Proteocephalus) was found in most of the smallmouth bass taken from this lake; however, the effects must not be too serious because many young smallmouth were captured with the seines, and reproduction of the species is evident. As yet, no efficient method is known for controlling this parasite. It is not harmful to man.

No serious parasites or predators were found in Little Portage Lake.

Shelter

The installation of brush shelters in the shallow waters of Big Portage Lake would add much needed cover for fish and probably aid in the establishment

of plant beds. They should be placed on the barren shallows along the edge of the "drop-off." Little Portage Lake has ample shelter in the form of the many plant beds.

Regulation of Water Level

The present dam in the outlet of Big Portage Lake seems satisfactory in maintaining a constant water level.

Improvement of Spawning Facilities

No improvement is needed.

INSTITUTE FOR FISHERIES RESEARCH

By L. E. Perry

Report approved by: A. S. Hazzard

Report typed by: R. Bauch